S.Q. TUBE

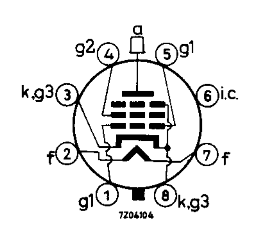
Special quality tube designed for use as wide band amplifier, cathode follower, series regulator tube for stabilised d.c. supply and output tube.

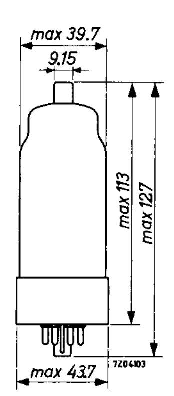
QUICK REFERENCE DATA			
Life test	10 000 hours		
Mechanical quality	Shock and vibration resistant		
Base	Octal		
Heating	Indirect A.C. or D.C.; parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	1.7	A
Anode current	I_a	100	mA
Mutual conductance	S	27.5	mA/V
Output power, one tube	W_o	11.5	W
two tubes, class AB	W_o	60	W

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Octal





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	1.7	1.62 - 1.78		A
Anode voltage	V_a	250			V
Grid No.2 voltage	V_{g_2}	150			V
Grid No.1 voltage	$-V_{g_1}$	15.5			V
Anode current	I_a	100			mA
Grid No.2 current	I_{g_2}	4			mA
Mutual conductance	S	27.5			mA/V
Amplification factor	$\mu_{g_2g_1}$	6.5			
Internal resistance	R_i	10			kΩ
Anode supply voltage	V_{ba}	275			V
Grid No.2 supply voltage	V_{bg_2}	180			V
Positive grid No.1 supply voltage	V_{bg_1}	15.7			V
Cathode resistor	R_k	300			Ω
Anode current	I_a	100	85 - 115	decrease max.40%	mA
Grid No.2 current	I_{g_2}	4	max. 6		mA
Mutual conductance	S	27.5	22.5 - 32.5	decrease max.30%	mA/V
Negative grid No.1 current	$-I_{g_1}$		max. 0.5	max. 1	µA
Cut off voltage					
Anode voltage	V_a	250			V
Grid No.2 voltage	V_{g_2}	150			V
Anode current	I_a	1			mA
Negative grid No.1 voltage	$-V_{g_1}$		max. 30		V

CHARACTERISTICS (continued)

		II	III	
Insulation resistance between one electrode and all other electrodes measured with V = 400 V	R_{isol}	min. 100	min. 20	MΩ



CAPACITANCES Without external shield

		I	II	
Grid No.1 to grid No.3, grid No.2, cathode and heater	C_{g_1/g_3g_2kf}	35		pF
Anode to grid No.3, grid No.2, cathode and heater	C_{a/g_3g_2kf}	17		pF
Anode to grid No.1	C_{ag_1}		max. 2	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

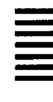
LIFE

Production samples are tested to be within the end of life values (column III) under the following conditions during 10 000 hours.

Anode supply voltage	V_{ba}	275	V
Grid No.2 supply voltage	V_{bg_2}	180	V
Grid No.1 supply voltage	$+V_{bg_1}$	15.7	V
Cathode resistor	R_k	300	Ω
Grid No.1 resistor	R_{g_1}	47	kΩ
Voltage between cathode and heater cathode positive	V_{kf} (k pos)	100	V

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max.	2000	V
	V_a	max.	900	V
Anode and grid No.2 voltage (triode connection)	V_{a+g_2}	max.	250	V
Anode peak voltage	$+V_{ap}$	max.	8000	V
Pulse duration: 18% of a cycle				
Anode peak voltage	$-V_{ap}$	max.	2000	V
Anode dissipation	W_a	max.	27.5	W
Anode plus grid No.2 dissipation (triode connection)	W_{a+g_2}	max.	27.5	W
Grid No.2 voltage	$V_{g_{2_o}}$	max.	550	V
	V_{g_2}	max.	250	V
Grid No.2 dissipation	W_{g_2}	max.	5	W
Grid No.1 voltage	$-V_{g_1}$	max.	150	V
	$+V_{g_1}$	max.	15	V
Grid No.1 dissipation	W_{g_1}	max.	0.1	W
Grid No.1 resistor with fixed bias	R_{g_1}	max.	0.5	MΩ
with automatic bias	R_{g_1}	max.	1.0	MΩ
Cathode current	I_k	max.	300	mA
Cathode peak current	I_{kp}	max.	1.5	A
Pulse duration max. 4 ms				
Average value max. 150 mA				
Cathode peak current	I_{kp}	max.	4.6	A
Pulse duration max. 1.5 μs				
Average value max. 14 mA				
Voltage between cathode and heater				
Cathode positive	V_{kf} (k pos)	max.	200	V
Cathode negative	V_{kf} (k neg)	max.	100	V
Bulb temperature	t_{bulb}	max.	225	°C



LIMITING VALUES (continued)

Heater voltage: The average heater voltage should be 6.3 V. Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life. The tolerance of the heater current (column II) should be taken into account.

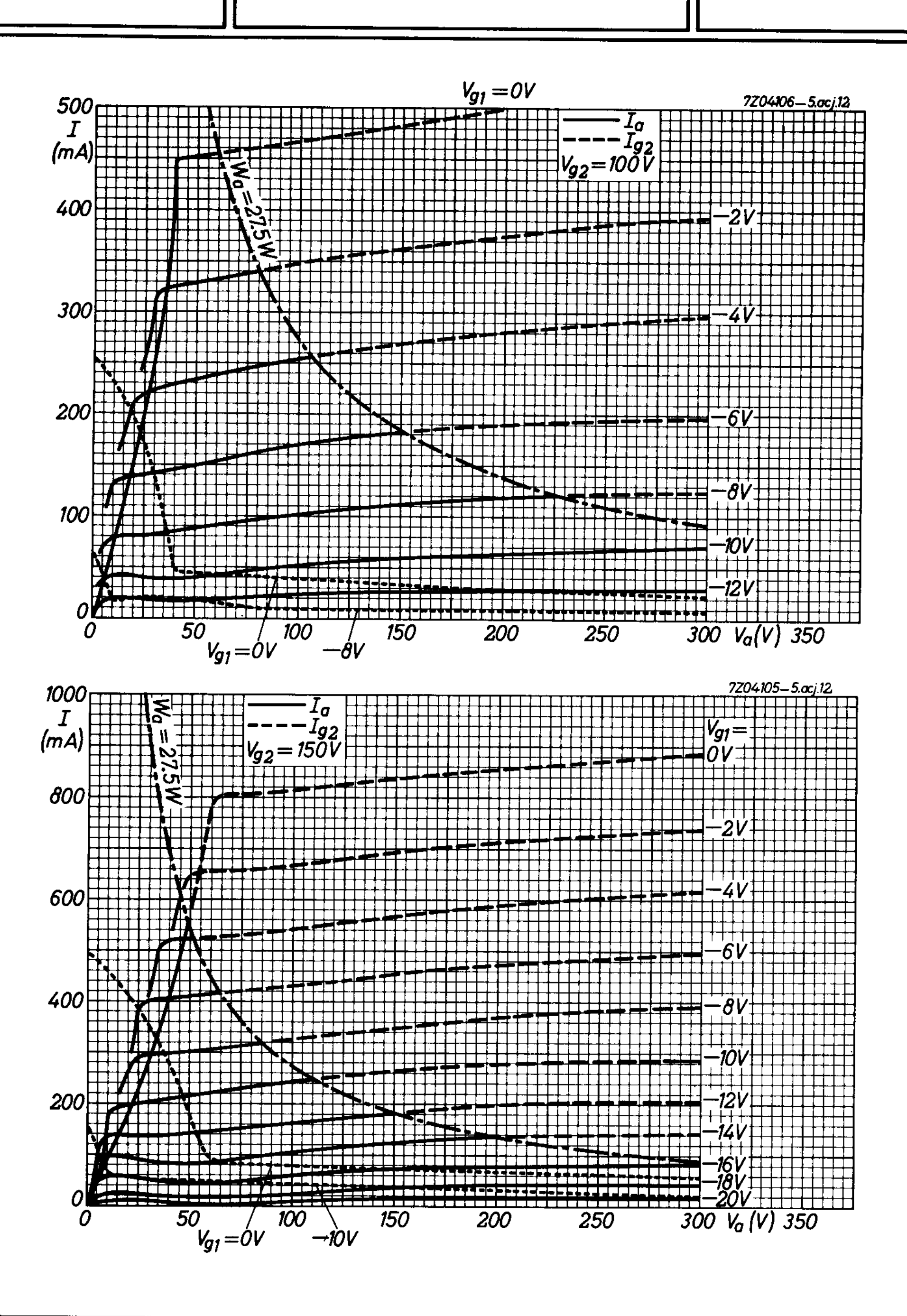
OPERATING CHARACTERISTICS

Output tube class A

Anode voltage	V_a	250	V
Grid No.2 voltage	V_{g_2}	150	V
Grid No.1 voltage	$-V_{g_1}$	15.5	V
Load resistance	$R_{a\sim}$	2.7	kΩ
Input voltage	V_i	3.82	V_{RMS}
Anode current	I_a	100	mA
Grid No.2 current	I_{g_2}	18	mA
Output power	W_o	11.5	W
Total distortion	d_{tot}	10	%

Output tube class AB (2 tubes)

Anode voltage	V_a		300		V
Grid No.2 voltage	V_{g_2}		150		V
Grid No.1 voltage	$-V_{g_1}$		17		V
Load resistance	$R_{aa\sim}$		1.6		kΩ
Input voltage	V_i	0	0.24	9.0	V_{RMS}
Anode current	I_a	2x80	-	2x182	mA
Grid No.2 current	I_{g_2}	2x2.5	-	2x22	mA
Output power	W_o	0	0.05	60	W
Total distortion	d_{tot}	-	-	5	%



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500
400
300
200
100
0
I (mA)
I_a
I_{g2}
$V_{g2}=100V$
$V_{g1}=0V$
$W_a=27.5W$
−2V
−4V
−6V
−8V
−10V
−12V
0
50
100
150
200
250
300
$V_a(V)$
350
$V_{g1}=0V$
−8V
7Z04105-5.acj.12
1000
800
600
400
200
0
I (mA)
I_a
I_{g2}
$V_{g2}=150V$
$W_a=27.5W$
$V_{g1}=$ 0V
−2V
−4V
−6V
−8V
−10V
−12V
−14V
−16V
−18V
−20V
0
50
100
150
200
250
300
$V_a(V)$
350
$V_{g1}=0V$
→10V



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I (mA): 0, 200, 400, 600, 800, 1000, 1200

V_{g1} (V): 0, −5, −10, −15, −20

—— I_a
- - - I_{g2}

$V_a = V_{g2} = 150V$

100V

$V_a = V_{g2} = 150V$

100V

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S (mA/V), R_i (kΩ): 0, 20, 40, 60, 80, 100

$-V_{g1}$ (V), I_{g2} (mA): 0, 5, 10, 15, 20, 25

I_a (mA): 0, 100, 200, 300

$V_a = 150V$
$V_{g2} = 100V$

S

I_{g2}

$-V_{g1}$

R_i



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Triode

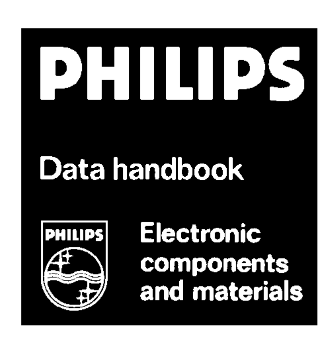
I_a (mA)

600
400
200
0

V_{g1} = 0V
−2V
−4V
−6V
−8V
−10V
−12V
−14V
−16V
−18V
−20V
−22V
−24V
−26V
−28V
−30V

W_a = 27.5W

0
50
100
150
200
250
V_a (V)



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